Modelling the costs and outcomes of changing general practitioner behaviours with respect to screening for at risk drinking

Marian Shanahan[1], Anthony Shakeshaft[1], Julia Fawcett[1],
Christopher M. Doran[2] and Richard P. Mattick[1]

[1] National Drug and Alcohol Research Centre, University of New South Wales
[2] School of Population Health, School of Economics, University of Queensland

Technical Report Number 219

ISBN: 0 7334 2233 0

ACKNOWLEDGMENTS

The authors wish to thank Rob Sanson-Fisher, Gawaine Powell-Davies, and Kate Conigrave for comments on the model.

FUNDING

This project was funded by the Alcohol Education and Rehabilitation Foundation.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Aim of project

The aim of this project was to determine which of four strategies, which if used to increase the provision of screening and brief intervention by Australian general practitioners (GPs), is the most cost-effective method in decreasing risky alcohol consumption among GP patients.

Rationale

Between 1992 and 2001, approximately 31,000 Australians died from alcohol-related disease and injury, with 75% of these deaths occurring among males. Harms resulting from excessive alcohol consumption not only utilise health care resources, but also contribute to lost productivity, road accident costs, and legal and court costs.

It is increasingly recognised that early screening and intervention with drinkers who are at-risk in the short-term may have significant benefits in the prevention of alcohol-related health and social problems (Gomel et al., 1998). This has meant a shift from primarily treating highly dependent drinkers to attempting to prevent harm among those whose alcohol consumption is typically characterised by low dependent, episodic drinking to intoxication. As the primary providers of health care, GPs are in a strong position to effectively modify behavioural risk factors at the population level as approximately 80% of Australians visit their GP in a year (Beaulieu et al., 2002); and the majority of the population believe that lifestyle issues should be discussed as a routine part of medical consultations (Ashenden et al., 1997). GPs are also expected to have the necessary skills to screen and provide some form of brief intervention to assist their patients to modify drinking behaviours. However, GPs screen fewer than half their patients for alcohol consumption or issues, even when these may be implicated in a range of other presenting health problems (National Expert Advisory Committee on Alcohol, 2001).

Methods

This project used a modelling approach to combine known information on the effectiveness of four separate strategies to change GP behaviours and the resources used to implement these strategies, to assess their relative cost effectiveness. The four strategies were academic detailing, computerised reminder systems, target payments and interactive continuing medical

education (CME). The model incorporated data on screening rates, alcohol consumption, rates of brief intervention by GPs, population that visit a GP, and the effectiveness and the costs of implementing the strategies.

Results

The computerised reminder system and academic detailing appear to be most effective in achieving a decrease in grams of alcohol consumed per year among risky drinkers. The cost differences (from baseline) for each of the various strategies are: $4.0 million for academic detailing, $5.0 million for interactive CME, $7.8 million for reminder systems, and $3l.5 million for the target payment strategy. The incremental cost effectiveness ratio, which is the difference in costs divided by the difference in outcomes, has a considerable range $50 per drink averted for academic detailing, $86 for interactive CME, $91 for computerised reminder systems and $691 for the target payment strategy.

One-way sensitivity analysis was used to explore uncertainty around many of the variables in the model. This confirmed the results, with the target payment strategy being the least efficient method of achieving a given decrease in alcohol consumption, although the relative cost effectiveness between the other three strategies varied depending upon assumptions being made.

Discussion

Regardless of the assumptions made, the effectiveness of the targeted payment strategy appears to be the least cost effective method to achieve a decrease in risky alcohol consumption, while the other three strategies appear reasonably comparable. This study, which used data from previously published work, was often limited by the availability of data. Another limitation was that only single strategies for invoking change were evaluated, and some studies report that combinations of strategies are the most effective however, the data for evaluating the cost effectiveness of combined strategies was not available.

There is obviously much more to learn about how to alter GPs behaviours with respect to screening for excessive alcohol use, but what is clear, is given the available data is using a targeted payment strategy is not an efficient use of resources.

1 INTRODUCTION

1.1 Aim of project

The aim of this project is to determine which of four strategies to increase the provision of screening and brief intervention by Australian general practitioners (GPs) is the most cost-effective method to decrease risky alcohol consumption among GP patients.

1.2 Burden of harm

Between 1992 and 2001, approximately 31,000 Australians died from alcohol-related disease and injury, with 75% of these deaths occurring among males (Chikritzhs et al., 2001). Harms resulting from excessive alcohol consumption not only utilise health care resources, but also contribute to lost productivity, road accident costs, and legal and court costs. Total costs attributable to those whose level of drinking is defined by the National Health and Medical Research Council (NHMRC) as high-risk or risky in the short-term far outweigh costs associated with high-risk or risky drinking over the long-term, as the former make up a larger proportion of the population (Rydon et al., 1992) (NHMRC, 2001). Consequently, it is increasingly recognised that early screening and intervention with drinkers who are at-risk in the short-term may have significant benefits in the prevention of alcohol-related health and social problems (Gomel et al., 1998). This has meant a shift from primarily treating highly dependent drinkers to attempting to prevent harm among those whose alcohol consumption is typically characterised by low dependent, episodic drinking to intoxication.

1.3 Prevalence of at-risk drinking

In order to optimally reduce the burden of alcohol-related harm, it is important to identify the nature and extent of problem drinking, so that the effectiveness of interventions can be improved by targeting them at defined behaviours (Tugwell et al., 1985). The 1997 National Survey of Mental Health and Well-Being (NSMHWB) examined the prevalence of alcohol disorders in Australia and found that 4.1% of the population were alcohol dependant according to the DSM-IV criteria and 1.9% experienced alcohol abuse. However, the 2001 National Drug Strategy Household Survey reported that at least 1 in 3 individuals over the age of 14 met NHMRC criteria for high-risk or risky drinking in the short-term on at least one occasion

during the previous 12 months (Australian Institute of Health and Welfare, 2002a). Males and those aged less than 25 years reported the riskiest drinking patterns, which reflects evidence that over half of all serious alcohol related road injuries (52%) recorded between 1990 and 1997 involved people aged 15-24 years, while a further 23% involved those aged 25-34 years (Chikritzhs et al., 2000).

1.4 Effectiveness of GP screening and brief interventions

Modifiable behavioural risk factors that contribute to the total burden of disease and injury in Australia include tobacco smoking (9.7%), physical inactivity (6.7%), alcohol consumption (4.9%), and obesity (4.3%) (Mathers et al., 2001). Although it is widely accepted that the role of a GP is to provide comprehensive and continuing care to their patients, and there are significant gains from modifying behaviours related to tobacco smoking, physical inactivity, alcohol consumption and obesity, the conduct of health promotion activity by GPs is often a minor part of their role (Raupach et al., 2001).

As the primary providers of health care, however, GPs are in a strong position to effectively modify behavioural risk factors at the population level as approximately 80% of Australians visit their GP in a year (Beaulieu et al., 2002); and the majority of the population believe that lifestyle issues should be discussed as a routine part of medical consultations (Ashenden et al., 1997). GPs are also expected to have the necessary skills to screen and provide some form of brief intervention to assist their patients to modify drinking behaviours. However, GPs screen fewer than half their patients for alcohol consumption or issues, even when these may be implicated in a range of other presenting health problems (National Expert Advisory Committee on Alcohol, 2001).

Randomised controlled trials have shown brief interventions can achieve short term reductions in alcohol use (Bien et al., 1993, Kahan et al., 1995, WHO Brief Intervention Study Group, 1996) and can be cost beneficial. A benefit-cost study of TrEAT, a brief intervention for excessive alcohol use provided by primary care physicians, found that the intervention, at a cost of US$205, had a benefit to cost ratio of 4.3:1 for health related costs, and a ratio of 39:1 for societal benefits after four years (Copello et al., 2001). This means that for every one dollar spent on brief interventions, there was $39 worth of savings to society over four years. In Australia, Wutzke et al. (2001) demonstrated that a GP-delivered Drink Less intervention cost AUD$19.10 per intervention, with a cost per additional life year saved of AUD$1,873 and a total population cost of AUD$12 million. This program used a self-screening questionnaire

distributed by the receptionist, with the GP intervening if the total score indicated problem drinking. It is important to note that this study, which allowed for GPs to be paid $17 extra for those patients who needed an intervention, and provided the materials necessary for GPs to receive vocational training points, achieved only a 40% participation rate of GPs into the study. Available evidence suggests that under controlled trial conditions, screening and brief interventions are efficacious and cost effective, both at the health system level and from the societal perspective, but the majority of GPs are not providing brief interventions (BI) outside of the study settings.

Barriers to GP provision of health promotion programs are well documented. Raupach et al. (2001) provides a thorough review of barriers including structural barriers, such as time and remuneration, barriers within the practice setting relating to a lack of infrastructure support, and barriers at the practitioner arid patient levels.

1.5 Attempts to increase provision of health promotion in Australia

1.5.1 Development of evidence-based guidelines

In recognition of the potential harmful effects related to low dependent problem drinking, the Royal Australian College of General Practitioners has recognized the role of providing appropriate screening and brief interventions. As such, they have prepared guidelines for the early detection of problem drinking (National Preventive and Community Medicine Committee of The Royal Australian College of General Practitioners, 2002), which includes recommendations that GPs screen patients at least every 3 years from the age of 14 or 15 years and provide, as a minimum, simple advice to reduce alcohol consumption.

1.5.2 Provision of resources and incentives to implement guidelines

Development of a practical framework and resource-base

The Smoking, Nutrition, Alcohol, Physical activity (SNAP) behavioural risk factor framework was developed to guide the implementation of integrated approaches to behavioural risk factor modification in general practice (joint Advisory Group on General Practice and Population Health, 2001). The SNAP framework advocates a system-wide approach to support GPs in the management of these risk factors. It is intended to reduce the level of competing pressures that GPs work under (Joint Advisory Group on General Pra[c]tice and Population Health, 2001).

Divisions of General Practice

The Australian Government established Divisions of General Practice in 1992. One benefit of the Divisions is that they provide information about service provision. Divisions have the capacity to engage with local populations and to develop programs that are of direct relevance to local GPs, and can support GPs by providing infrastructure and financial reimbursement (at a non-consultation level). Given that Divisions assist GPs with a wide range of issues related to the provision of health care, they have the capacity to support the implementation of health promotion initiatives.

Enhanced Primary Care (EPC)

The Australian Government has also acknowledged that the current fee-for-service system often hinders GPs from engaging in prevention activity. In November 1999, the Enhanced Primary Care (EPC) package was introduced, with the aim of improving preventive health care and co-ordination of care (Commonwealth Department of Health and Aged Care, 1999). The EPC Medicare items provide a framework for a multidisciplinary approach to health care through a more flexible and responsive match between care recipients' needs and services. Additional items have since been added to this package, including counselling for mental health disorders, health checks for older Australians, and items to improve the co-ordination of health care services for people suffering from chronic conditions and with complex needs (Australian Department of Health and Aging, 2004).

The Practice Incentive Program (PIP) is part of this blended payment approach to general practice. Payments made to practices through the program are in addition to other income generated by the GPs and the practice. The aim of the PIP is to reward practices for providing comprehensive, quality care, and to provide payment for services not recognised by the fee-for-service system. The payments cover five areas: information management and information technology (IM/IT), after hours care, rurality, teaching, and targeted incentives (Australian Department of Health and Aging, 2004).

Although the PIP does not address alcohol-related problems directly, it represents an approach which might be used to encourage GPs to provide improved quality of care to patients. It also addresses the issue of appropriate financial reimbursement. However, GPs have identified several barriers to the adoption of PIP items: time, organisation, communication, education, and resources (Blakeman et al., 2001).

In summary, while these various strategies support health promotion activities, there is no consistent evidence with which to gauge the effectiveness or the cost effectiveness of providing these resources and incentives.

1.6 Economic evidence on attempts to change GPs' behaviours

After reviewing the economic literature on continuing professional development, Brown and colleagues determined that there was insufficient evidence to permit any empirical conclusions to be drawn about the economic value of professional development (Brown et al., 2002). This review identified nine economic analyses of which seven were cost effectiveness analyses and two were cost benefit analyses.

A paper by Mason and colleagues provides a model for evaluating the costs and effects of changing the behaviours of health professionals. Using a series of equations, they illustrate the importance of not only the cost effectiveness of the treatment, but also the cost of implementation, the necessity to include the uptake rate of the intervention by practitioners, the number of practices, the number of patients, and the prevalence of the condition targeted (Mason et al., 2001).

This project uses such a model to estimate the costs and outcomes of four separate strategies to increase screening and brief intervention rates by Australian GPs as a method of decreasing alcohol consumption by risky drinkers. The primary aim is to assess which strategy may be the most cost effective, using data available in the literature.

2 METHODS

2.1 Modelling

Given the lack of reliable evidence for comparing the costs and cost effectiveness of various strategies to change GPs' behaviours with respect to patients' at-risk drinking, a decision modelling approach is used to combine what is known about the effectiveness of strategies to change GP behaviours and the resources used to implement these strategies. To optimise relevance to the Australian context, Australian data are used wherever possible, complemented by international data.

What is decision modelling and why use it?

Models are often used in economic evaluations when valid and reliable empirical data (e.g. from randomised controlled trials) on costs, the epidemiology of disease, or screening/treatment effectiveness are not available for each alternative intervention, or when the relationship between costs and effects needs to be estimated under different assumptions (Claxton et al., 2002). Moreover, even where good quality trial data do exist modelling is often required to extrapolate the empirically demonstrated short-term effects, to predict longer term outcomes of interest, such as mortality. Modelling essentially provides a method for combining information to provide answers to policy or clinical questions. The data used may be: known or estimated; epidemiological data about disease processes; or costs and outcomes of alternative interventions.

Economic modelling is essentially a method of providing policy relevant results. It is not meant to replace data obtained from clinical trials, but can often be used as a tool in conducting economic evaluations. There are a number of reasons why modelling maybe used to address economic and policy questions (Buxton et al., 1997, Claxton et al., 2002). These include:

- when data from one setting needs to be generalised to another (e.g. incorporating international evidence into the Australian context);
- when intermediate clinical outcomes are extrapolated to final outcomes (change in alcohol consumption to life years saved);
- to make head-to-head comparisons where relevant trials do not exist; informing decisions in the absence of hard data.

2.2 Limitations to modelling

Those working in different paradigms often raise concerns with the use of economic modelling. For example, biomedical scientists have as a higher priority studies which result in high internal validity, whereas social scientists, such as economists, are often working with observational data which produce higher external validity (Buxton et al., 1997).

There are a number of recognised limitations associated with the use of modelling. These include the possible existence of bias in the data which is applied to a model. This maybe from often having only a single data point for some variables or alternatively having only data from diverse sources. These limitations can be minimised by having transparency of methods and results, using data from large meta-analytic reviews that produce pooled-estimates or data from randomised controlled trials wherever possible, minimising use of expert opinion as a data source, and using sensitivity analysis to explore the impact of uncertainty.

2.3 Model

The model (see Figures 1 & 2) begins with the premise that a proportion of the population visit a GP at least once per year, and, of that population, some proportion has risky drinking behaviours. For a percentage of their patients, GPs currently provide screening and/or some form of brief intervention. Of the individuals who are screened and/or receive a brief intervention, some will change their drinking behaviours and others will not. This is the starting point for the model, or the base case.

Once the base case is established, each strategy to change GP behaviours (target payments, academic detailing, computerised reminder systems or interactive CME) is added separately.

When a strategy is offered, some GPs will take it up and a proportion of them will change their behaviours, others will begin and not complete the strategy or not change their screening for risky drinking behaviours (see Figure 2). Once each strategy is added to the model, the difference in outcomes and costs are compared between baseline and each strategy.

The data used in the model and their sources are found in Table 1. The variables are discussed below.

Figure 1: Baseline scenario for the economic model

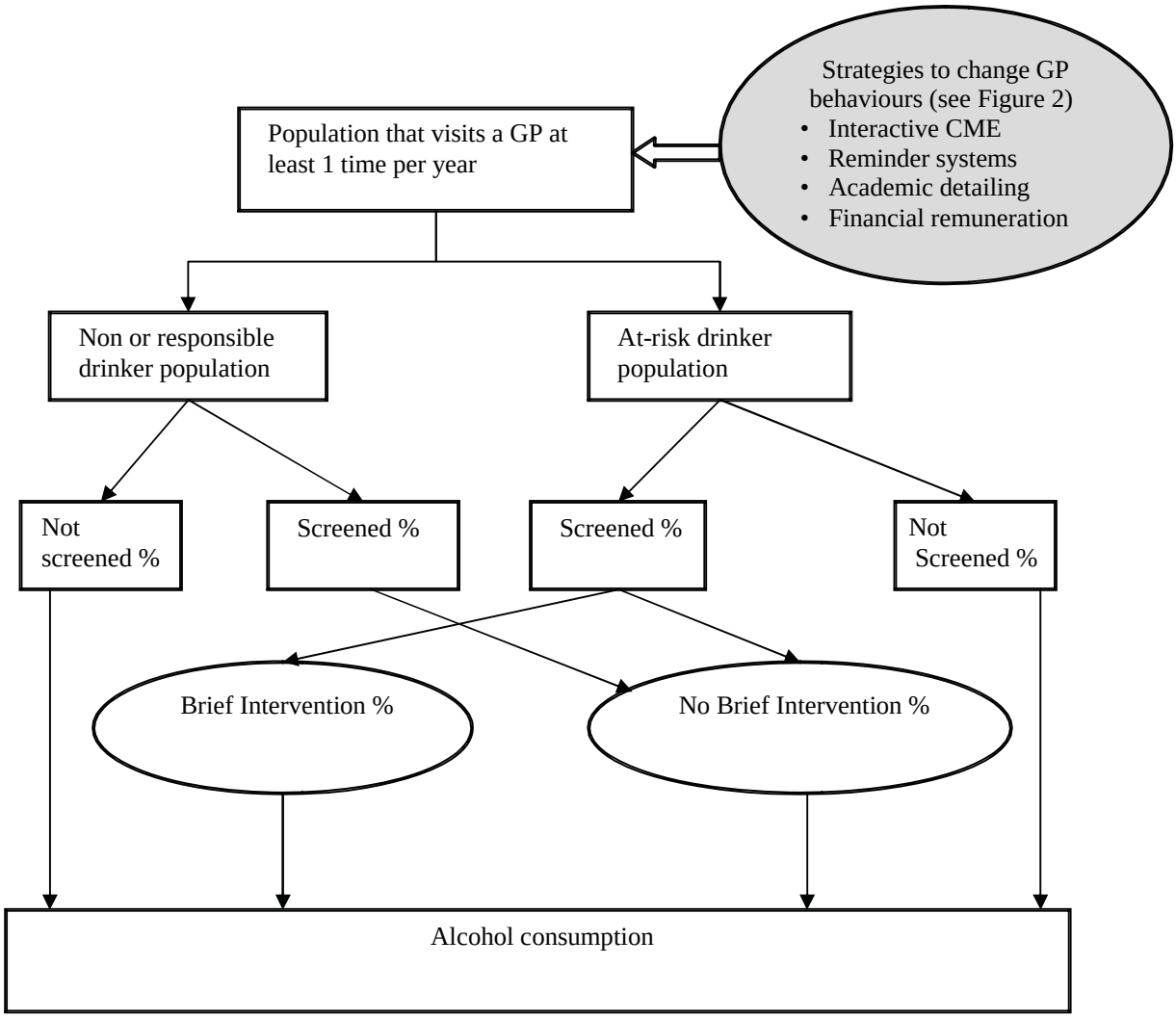
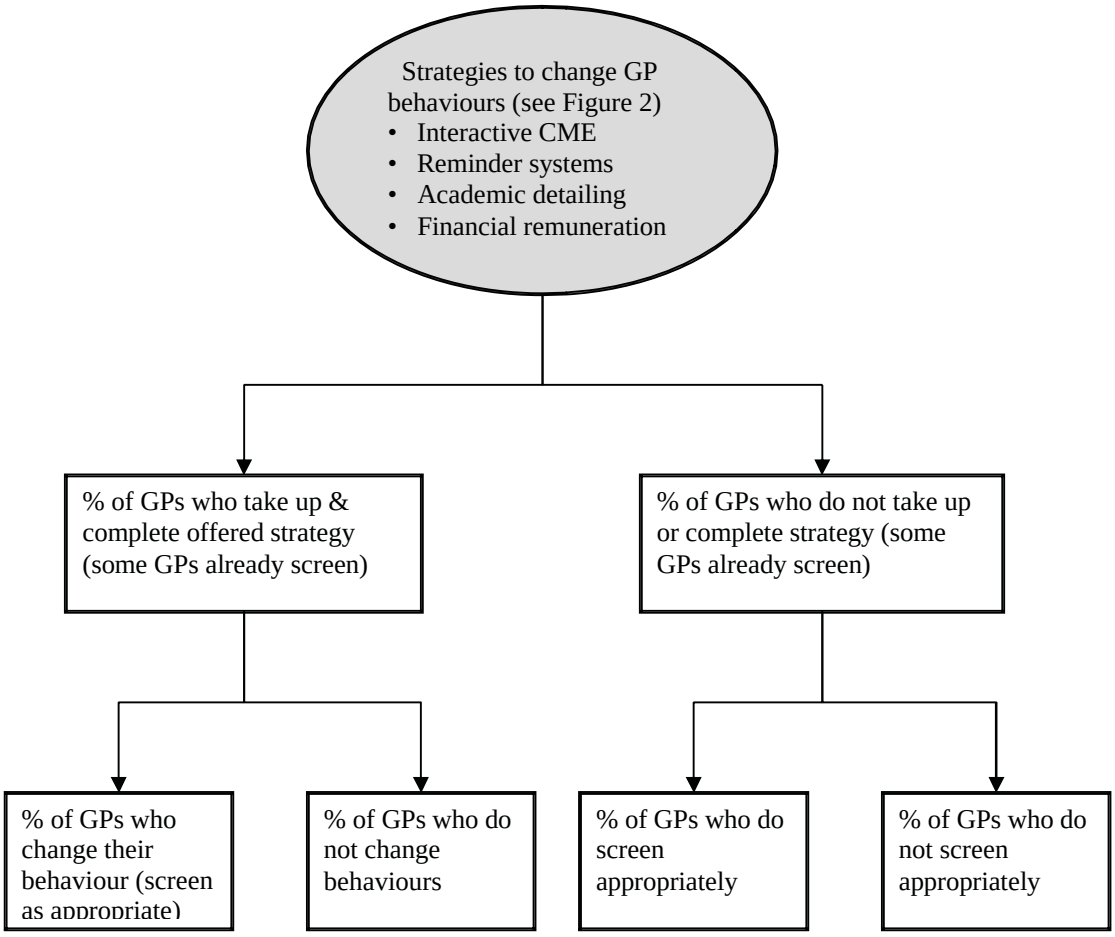


Figure 2: Strategies to change GP behaviour model



2.3.1 Baseline population and at-risk drinking

The 81% of the population that is 18 years or older and who visit a GP at least once in a given year (Australian Institute of Health and Welfare, 2004) is the population which is used in the model. Data collected for the Bettering Evaluation and Care of Health Project (BEACH) were used to assess the `at risk' alcohol status of the adult population in Australia (aged at least 18 years) that visits a GP at least once a year (Britt et al., 2001-2004). These data estimate 4.1% males and 3.3% of females who visited a GP between April 2001 and March 2004 were classified as at-risk drinkers (consumed more than 28 or 14 standard drinks per week for males and females respectively). Inclusion of drinkers at risk of harm in the short term would have made the data more inclusive; however, for reasons related to the structure of the BEACH data, it was not possible to include this population. This issue is addressed further in the sensitivity analyses.

2.3.2 Screening behaviours

Baseline screening rates were obtained from the literature. Three types of data were available: self-report data, data collected during random controlled trials (RCTs), and chart reviews. Self-report data, obtained by asking doctors how often they screen their patients for excessive alcohol use, is likely to be over stated, as is data collected during RCTs. Retrospective chart reviews are likely to be relatively more valid, but are not widely employed in this type of research. Reported screening rates vary from 3% (Silagy et al., 1992) to 76% (Lewis et al., 1991). Self reported rates are higher, at 76% for internists (Lewis et al., 1991) and between 30 to 40% (McAvoy et al., 1999, Calnan and Williams, 1993, Spandorfer et al., 1999) whereas rates derived chart reviews or interviews from patients are lower, at 12%-15% (Heywood et al., 1994). Taking this variation into account and excluding the study which included only internists, a baseline screening rate of 20% was estimated. As this study compares the costs and effects of the various strategies to alter GPs' behaviours relative to the same baseline estimates, the absolute accuracy of the baseline estimates are not critical for their cost effectiveness comparisons. However, given the accuracy of baseline estimates do impact on estimates of the Goal costs, the effects of the baseline screening rates are also examined in the sensitivity analyses.

2.3.3 Rate of brief intervention

Based on an Australian randomised controlled trial, it was assumed that 63.9% of patients - whose alcohol consumption is detected as being at-risk - receive an intervention (Gomel et al., 1998). Based on estimates provided in a number of published studies, the range used for sensitivity analyses is 32% to 96% (Heywood et al., 1994, Ewing et al., 1999).

2.3.4 Change in alcohol consumption

The effectiveness of brief interventions in changing alcohol consumption was obtained from a recent report (Gibson in Shanahan, 2005,) which assessed the literature on brief interventions based on a set of criterion including:

- Only those studies that excluded subjects who had previously identified that they might have a risky or dependent level of drinking were included, in order to limit the sample to those who had not yet been recognised as dependent drinkers;
- Evaluations of multi-session brief interventions were excluded, to maintain a focus on short, single-session brief interventions only,

- Only studies which reported a standardised outcome, which could be converted into grams of alcohol consumed per week, were included, since a single outcome measure, comparable across studies, was required;
- Only studies that reported results for males and females separately were included. Four studies met each of these criterion (Ockene et al., 1999, Richmond et al., 1999, Wallace et al., 1988a and WHO Brief Intervention Study Group, 1996)[1], reporting an overall reduction in grams of alcohol consumed of 27% in males and 36% in females who were screened and received a brief intervention, and 12% decrease in males and 25% in females who received screening only.

2.3.5 Identifying strategies aimed at changing GP behaviour

For the remainder of this report, interventions aimed at changing GP behaviours will be referred to as strategies, in an attempt to clearly differentiate them from brief interventions aimed at changing patients' drinking behaviours.

The first step is to determine which interventions are most likely to change GP behaviours. A number of relevant systematic reviews have reached similar conclusions: no particular type of intervention is inherently effective, with the success of an intervention often depending upon the circumstances in which it is used (Greco and Eisenberg, 1993, Bero, et al, 1998, Hulscher, 1999). Combinations of interventions are often found superior to individual strategies, probably because they can target several barriers simultaneously (Greco and Eisenberg, 1993, Hulscher et al., 1999, Grimshaw et al., 2001).

An overview of systematic reviews of behaviour change strategies, published between 1966 and 1998, identified 41 reviews, and concluded that passive strategies were typically ineffective, while most other approaches were effective in some circumstances (Grimshaw et al., 2001). Reminders were identified as a promising approach. Multifaceted interventions based on assessment of potential barriers to change were found more likely to be effective than single strategies (Davis et al., 1995).

However, it may be that the provision of preventive care is different from curative care, such that effective strategies to improve physicians' delivery of these may differ. Consequently,

[1] Study sites were in Australia, Bulgaria, Costa Rica, Kenya, Mexico, Norway, Russia, Wales, USA and Zimbabwe.

results of reviews that have concentrated specifically on preventive practices in primary care have been identified and examined (Hulscher et al., 1999, Hulscher et al., 1996, Wensing and Grol, 1994).

Wensing and Grol conducted a literature review of 75 studies, published between 1980 and 1992, of strategies for implementing change in primary care practices. Forty eight percent of these studies dealt with preventive routines (Wensing and Grol, 1994). Strategies most often studied were feedback, reminders, and group education. The most effective strategies appeared to be individual instruction, feedback, and reminders. Individual instruction combined with other strategies (such as reminders or feedback), and peer review combined with feedback, appeared to be the most effective combinations of strategies. Although about one third of the studies included in this review were randomised trials, 29% had no control group, raising issues about the methodological quality of some studies included in the review. Hulscher and colleagues conducted a systematic and critical analysis of studies describing the effects of different interventions to promote preventive activities in primary care (Hulscher et al., 1999). They focused on interventions which targeted professional, organisational, financial, and regulatory barriers. Only randomised controlled trials and controlled before and after studies were included. They identified 58 studies, comprising 86 comparisons. Most interventions were found to be effective in some studies and not in others.

After reviewing this literature, the following strategies were selected for this study academic detailing (educational outreach), interactive continuing medical education (CME), computerised reminder systems, and target payments. Not included were traditional passive CME, feedback and local opinion leaders. Passive CME was excluded as it is generally agreed that passive approaches to sharing information is not effective (Wensing and Grol, 1994, Davis et al., 1995). The local opinion leader strategy was excluded given its similarity to academic detailing and interactive CME and the challenges as how to identify who local opinion leaders might be for a national strategy. The third strategy excluded was feedback. Despite evidence that it is effective in changing physician behaviour, there is a lack of data on the resources required to implement this strategy (Fleming, 1997, Bauchner et al., 2001).

Academic detailing (educational outreach)

Educational outreach or academic detailing refers to practice-based educational activities focused on individual practitioners, involving outreach visits offering short presentations, skills training, performance feedback and discussions (Fleming, 1997). A review of this

approach identified 18 studies, 13 of which targeted prescribing behaviour and three of which targeted preventive services (Thomson O'Brien et al., 1997). Positive effects were observed in all studies, most of which were statistically significant. Effects were small to moderate, indicating that educational outreach appeared to be effective, especially when social marketing was included. Davis and colleagues also identified outreach visits as an effective strategy (Davis et al., 1995).

Studies conducted as part of the World Health Organisation Collaborative Study on Disseminating and Implementing Brief Alcohol Intervention in Primary Health Care used direct mail, telemarketing and academic detailing to examine the uptake of brief interventions for hazardous and harmful alcohol. The outcome was whether physicians participated in a 3 month trial of a brief intervention package for hazardous and harmful alcohol consumption and whether they used the package. Studies conducted in Australia, Denmark, New Zealand and the LX found that the uptake of the intervention package was either the same or significantly higher for the telemarketing strategy compared with the academic detailing (Gomel et al., 1998, Lock and Kaner, 2000, Lock et al., 1999, McCormick et al., 1999, Hansen et al., 1999). Both telemarketing and academic detailing were more effective than the direct mail strategy (Gomel et al, 1998).

Interactive continuing medical education (CME) workshops

Group education sessions seem to vary in their effectiveness, depending on their structure and content (Fleming, 1997). Hulscher and colleagues reviewed group education as a behaviour strategy (Hulscher et al., 1999, Hulscher et al., 1996). Five comparisons were located differences in the provision of preventive services between experimental and control ons varying between -4% and 31%. The difference was in favour of the intervention in four of the five comparisons. Another review identified 32 studies (36 comparisons) the effects of educational meetings on professional practice and health care outcomes (Thomson O'Brien et al., 2001). Ten of the comparisons included interactive workshops and of , six had moderate or moderately large effects, all of which were statistically significant. remaining four comparisons all reported small effects, only one of which was statistically 'cant. This led them to conclude that interactive workshops can result in moderately large in professional practice. In support of this finding, a review of the impact of formal education found that interactive and mixed educational sessions had a significant on practice (effect size 0.67, 95% confidence interval, 0.01 - 1.45) (Davis et al., 1999).

Target payments

Fee-for-service, the predominant system in Australia for remuneration of doctors, pays for each or unit of care provided. Target payments are a form of fee-for-service for which the practitioner is remunerated if he/she completes a specific service or reaches a targeted level of service. Service Incentive Payments (SIP) are a form of target payments where a payment is received if a particular service (i.e. immunisation, Pap smear, or care plan) is provided to a specific population (Commonwealth Department of Health and Aged Care, 1999).

Research on the effect of financial incentives is sparse (Greco and Eisenberg, 1993, Town et al., 2005). Looking particularly at target payments, Giuffrida and colleagues (Giuffrida et al., 1999) found only two studies using satisfactory study designs and Town and colleagues (2005) located only six studies between 1966 and 2002 in which the impact of financial incentives were studied. Both reviews found only one study (Kouides et al., 1998) where financial incentives led to significant increase in provision of preventive care. Kouides and colleagues investigated the effect of target payments on the rate of influenza immunisation of patients aged 65 or older (Kouides et al., 1998). Doctors received additional 10% ($0.80) above the standard $8 fee for each vaccination if they immunised 70% of their relevant population and an additional 20% ($1.60) if they achieved 85% immunised. The change in immunisation rates from baseline was 10.3% in the intervention group and 3.5% in the control group.

Computerised reminder systems

Reminders, manual or computerised, improve the quality and quantity of preventive health care services. This strategy is one of the best documented at increasing physician delivery of preventive services (Wensing and Grol, 1994, Bauchner et al., 2001). In the review by Hulscher et al (Hulscher et al., 1996), nine comparisons of physician reminders versus no intervention showed an absolute change of preventive services varying between 5 and 24%. Davis and colleagues also reported that patient reminders were an effective intervention: 22 of 26 interventions resulted in changes, whereas four interventions from two studies failed to demonstrate a statistically significant change (Davis et al., 1995). Given the investment in information technology that many health systems are making, this is an area for significant potential improvement (Bauchner et al., 2001).

2.3.6 Costs

The data for the cost of implementing each strategy would preferably be from a single source,

from the same year, and be Australian. A common source of cost information for economic models is RCTs but there are few RCTs that included any economic assessment of costs. As a general approach, either resource data was compiled from multiple sources and costed using 2004 Australian dollars, or existing Australian costs were converted into 2004 Australian dollars. Following is a description of the costs used for each of the strategies. The costs to government of organising and implementing the various strategies are not included. For example, while the direct costs of increased medical payments, computer programs, or outreach visits are included, die costs of the infrastructure to develop and maintain the strategies are not.

Table 1: Variables and data used in model

Variable	Rate	Range (for Sensitivity analysis)	Data available	Sources
Population who had at least one GP visit per Year (18+)	81.1%		By age and sex categories	Australian Institute of Health and Welfare, (20026)
Population who consumed alcohol at risky levels				
Males who drink more than 28 drinks per week (varies by age)	4.1%	20.5%	By age categories, BEACH sample	Britt et al., (2001-2004)
Females who drink more than 14 drinks per week (varies by age)	33%	18.4%	By age categories, BEACH sample	Britt et al., (2001-2004)
Average number of drinks per week risky drinkers				
Males (varies by age)	46		By age categories, BEACH sample	Britt et al., (2001-2004)
Females (varies by age)	23		By age categories, BEACH sample	Britt et al., (2001-2004)
Baseline screening for alcohol consumption rate	20.0%	14.0%-45%	Combination of RCT, Self report studies	Gomel et al., 1998, Weller et al., 1992, Silagy et al., 1992, McAvoy et al., 1999, Bonevski et al., 1996, Ewing et al., 1999
Number of GPs	21,671			Australian Institute of Health and Welfare, 2004, Table 5.23
GP uptake of behaviour change strategies				
Academic detailing	50%	29%-79%	RCTs	Gomel et al, 1995, Lock et al, 1999, McCormick et al, 1999, Hansen et al, 1999
Interactive CME	47%	11%-69%	Cochrane review	Thomson O'Brien et al, 1997
Computerised reminder system	78%	72%-90%		As for financial remuneration
Financial remuneration	78%	72%-90%	HIC data	Health Insurance Commission, 2001; HIC (Health Insurance Commission) 2004

Table 1: Variables and data used in model (cont'd)

Variable	Rate	Range (for Sensitivity analysis)	Data available	Sources
Relative improvement in screening rates post- completion of behaviour change strategies.				
Academic detailing	19.0%	9.8%-50%	RCTs	Cockbum et al, 1992, Gomel et al, 1998, Lobo et al, 2002, Bernal-Delgado et al, 2002
Interactive CME	15.0%	12.0%-25.0%	Cochrane review	Thomson O'Brien et al, 1997
Computerised reminder system	13.1%	10.5%-15.6%	3 Meta analysis including 33 prevention studies	Balas et al, 2000, Davis et al, 1995, Dexter et al., 1998, Hulscher et al, 1996, Bennett and Glasziou, 2003
Financial remuneration	7.0%	0.1%-26%	1 RCT, 1 before and after study, HIC data	Giuffrida et al, 1999, Kouides et al, 1998, Ritchie et al, I992
Rate of brief intervention post positive screening	63.9%	32%-96%	RCT, Self report studies	Ewing et al, 1999, Gomel et al, 1998, Heywood et al, 1994
Percentage change in gm alcohol consumption post screening			Selected from meta analysis studies	Fleming et al, 1997, Richmond et al, 1995, Wallace et al, I988b, WHO Brief Intervention Study Group, 1996, Ockene et al, 1999
Males	12%			
Females	24%			
Percentage change in gm alcohol consumption brief interventions			RCTs	Fleming et al, 1997, Richmond et al, 1995, Wallace et al, I988b, WHO Brief Intervention Study Group, 1996, Ockene et al, 1999
Males	27%			
Females	36%			
Costs				
Brief intervention per service	$24	$14.25		Australian Department of Health and Aging, 2004
Academic Detailing per GP	$356	$230-$480	RCTs, and reviews	Cockburn et al, 1992, Silagy and May, 1997, Wilson et al, 1992
Interactive CME per GP	$485	$242-$727	Data from program implementation	Personal communication (F. Shand, 2004)
Reminder per GP	$450	$225-$675		Health Insurance Commission, 2004
Target payment per patient in practice	$0.25			Health Insurance Commission, 2003
plus				
Per screen	$10	$5-$15		

Academic detailing - Costs for academic detailing were obtained from three separate sources and converted into 2004 AUD using the Australia CPI (ABS, 2004). An evaluation of DATIS, a project designed to provide drug and therapeutic information in South Australia, provided a base cost of $356 per GP (Silagy and May, 1997). This cost includes the costs of educators, administration, printed materials, and travel. The impact of varying these costs was tested in the sensitivity analyses. The costs from an Australian study on the cost effectiveness of brief intervention (Wutzke et al., 2001) were used for the upper range and for the lower range a study

which examines methods for changing GP behaviours towards smoking cessation programs was used (Cockburn et al., 1992).

Interactive CME - The costs for this strategy are based on the costs of a similar program run by the National Drug and Alcohol Research Centre (NDARC) for drug and alcohol workers. This project involved the provision of interactive workshops on the implementation of the Guidelines for the Treatment of Alcohol Problems (personal communication F. Shand 2004). The costs for a nationwide program included staff time, on costs, travel, telephone, postage, and the costs of training materials.

Financial remuneration (targeted payments) - As only one published study on the effect of target payments identified an actual payment ($0.80 per immunisation an immunisation rate of 70% and $1.60 for 85% in US 1992 dollars) this current study used an incentive payment based on the Practice Incentive Program (PIP) and Service Incentive Payments (SIP) as established by Australian Commonwealth Department of Health. In these programs, target payments are made to practices, in addition to other income generated by GPs, with the aim of rewarding general practices for providing payment for services not recognised by the fee-for-service system (Australian Department of Health and Aging, 2004). PIPs reward practices and SIPS are payments to an individual practitioner.

PIPs are either a one-off payment for registering with a program and/or an annual payment made, for example, for maintaining a patient registry. A payment is made to the practice based on the number of eligible patients enrolled in the practice. The PIP payments range from $0.25 per patient for practices that agree to provide cervical screening or asthma data to the Australian Government up to $2 per patient for the use of bona fide electronic prescribing software for generating the majority of scripts in the practice (HIC22001). SIPs are paid for the provision of a specific service. Examples include a payment of:

- $18.50 made to GPs and other medical practitioners, for each notification to the Australian Childhood Immunisation Register, of a vaccination that completes an immunisation schedule;
- $20 made to medical practitioners for each annual cycle of care for a patient with diabetes, payable once per year per patient;
- $35 is made for screening women between 20 and 69 years who have not had a cervical smear within the last four years; and

- $150 is made on completion of a 3 step mental health process for patients that fit the criteria.

To date, the various SIP and PIP programs appear not to have been evaluated, making the decision as to what value to use as an incentive to improve screening for risky alcohol difficult. Data exists on the number of practices that take-up PIPs, as does the number of SIP payments; however, the data on the effectiveness or change in practice as a result of the payments is limited as little data was collected prior to the introduction of the program.

Data from a Productivity Commission Report on the direct and administrative time spent by GPs and their staff related to various PIPs and SIPS, and the costs of that time, was used to identify a reasonable incentive payment for a brief intervention (Productivity Commission, 2003). It was estimated that $10 per patient screened would cover those costs of both direct and indirect time. As in the diabetes and cervical screening programs, a $0.25 per patient per year was included to cover other administrative costs (SIP). Five and fifteen dollars were used in the sensitivity analyses. The model does not model a differential uptake of the program based on these different payments.

Computer Reminder systems - The cost of the computer reminder system was based on the cost per year of medical based software of $450 per year (personal communication). An assumption here is that every practice would have an existing computer and that the cost of the necessary software would not be passed on to the GP. An alternate method of costing this program, used in the sensitivity analyses, was for the GP to pay for the software and the Commonwealth to pay participating GPs $2 per patient per year, as currently paid to GPs for the use of `bona fide' electronic prescribing software to generate scripts.

2.3.7 Payments for Brief intervention

In the model, GPs did not receive a payment for screening (except in the Target payment strategy) but a payment of $23.55 was made for each appropriate brief intervention. This fee was the difference between MBS Codes B and C, making the assumption that the brief intervention changes the duration of the visit from a B type visit to a C type visit.

2.4 Combining the cost and outcomes

Once the costs and outcomes for each strategy were determined, the model was run. This involved first estimating the number of standard drinks at baseline and for each strategy

separately, and then estimating their respective costs. When conducting a cost effectiveness analysis, after the costs and outcomes are measured, the next step is to estimate incremental cost effectiveness ratios (ICER). An ICER estimates the cost per additional unit of outcome achieved, where the outcome is measured in some "natural unit". In this study the natural unit is a standard drink Such analysis allows comparison of the efficiency of different interventions that are designed to produce a given outcome (Gold et al., 1996, Goodman et al., 1997, Drummond et al., 1997).

When estimating an ICER, a baseline comparator is necessary, this is commonly the `current standard' method or the 'do-nothing' option. Here all strategies are compared to baseline

$$(Cost_i - Cost_{co}) / (Effect_i - Effect_{co})$$

where i is academic detailing, computerised reminder systems, interactive CME or financial remuneration, and w is baseline; Cost is the total cost for each strategy and Effect is the number of standard drinks consumed.

3 RESULTS

Table 2 presents the results for the baseline model and each of the four strategies. Column A has the number of drinks among risky drinkers if they received no screening or brief intervention; Column B presents the number of drinks among risky drinkers as a result of the current baseline behaviour and for each of the four strategies; Column C presents the difference in drinks consumed for each model compared to baseline. Columns D & E present data for costs, with Column D providing the costs of implementing the strategy and a payment for each brief intervention, and Column E is the difference between each strategy and baseline costs. The final column is the incremental cost effectiveness ratio - the ratio of the difference in costs to the ratio of difference in effects, where each strategy is compared to the baseline.

The base case, which is compared to each of the strategies, has the following assumptions: 20% of the adult population who visit a GP are screened for risky alcohol consumption each year, 64% of those screened as risky drinkers receive a brief intervention. The decrease in grams of alcohol consumed following screening is 12% for men, and 24% for women; following screening and brief intervention is 27% for men and 36% for women. At baseline, there were an estimated 240,493 males who consume on average 46 drinks per week, and 240,493 women who consume on average 23 drinks.

The computerised reminder system and academic detailing appear to be most effective, achieving a decrease in grams of alcohol consumed per year among risky drinkers of 85,370 and 79,371 respectively. The cost increase (from baseline) for the various strategies are: $4.0 million for academic detailing, $5.0 million for interactive CME, $7.8 million for reminder systems and $31.5 million for the target payment strategy. The incremental cost effectiveness ratio, which is the difference in costs divided by the difference in outcomes, has a considerable range: $50 per drink averted for academic detailing, $86 for interactive CME, $91 for computerised reminder systems and $691 for the target payment strategy.

Table 2: Costs and outcomes for various strategies to change GP behaviours

Strategy	Total standard drinks before	Total standard drinks after	Difference in standard drinks from baseline	Total costs for each strategy (AUD 2004)	Difference in costs	ICER (cost per standard drink avoided)
	A	B	C	D	E	E/C*(-1)
Baseline	16,713,703	15,878,215		$1,463,275		
Academic detailing		15,798,843	-79,371	$5,462,211	$3,998,936	$50
CME interactive		15,819,313	-58,902	$6,503,463	$5,040,188	$86
Computerised reminder system		15,792,844	-85,370	$9,219,313	$7,756,038	$91
Financial remuneration		15,832,597	-45,618	$32,984,330	$31,521,055	$691

4 SENSITIVITY ANALYSES

One-way sensitivity analysis was conducted to explore uncertainty around many of the variables in the model. The ICERs for each of the sensitivity analyses are presented in Table 3. When the components of the model were varied, as per the low and high ranges shown in Table 1, there are some considerable variations in the ICERs. The main consistent result, however, is that the targeted payment strategy appears to remain the least efficient method of achieving a decrease in grams of alcohol consumed. Depending upon the assumptions made, the target payment strategy appears to be at least twice as expensive in achieving a decrease in grams of alcohol (assuming the highest rate of screening found in the literature) and up to forty times more expensive (assuming the lowest rate of screening).

Change in number of drinks consumed was used in the model, as this was the outcome for which there was the most data available; however, the cost per decrease in standard drink is not easily interpreted in the policy context. Therefore, data from Beich and colleagues on the proportion of risky drinkers who become sensible drinkers post-screening and brief intervention (Beich et al., 2003) were used in a final sensitivity analysis. Once again a similar pattern is produced, with the target payment strategy the least efficient method, costing $15,354 to change one person from risky drinking compared to $1,120 for academic detailing, $1,902 for CME interactive and $2,019 for computerised reminder systems.

Table 3: Sensitivity analysis one variable changes per row)

	Academic detailing	CME interactive	Computerised reminder system	Target payment
ICER (Cost per drink avoided)				
ICER from Table 2 (last column)	$50	$86	$91	$691
Varying: Screening rate (least improvement)	$164	$449	$127	$5,242
Screening rate (highest improvement)	$13	$35	$67	$104
Brief Intervention rate (low)	$38	$42	$88	$275
Brief Intervention rate (high)	$13	$27	$34	$158
Uptake of the strategy by GPs (high)	$163	$86	$91	$616
Cost of strategy (low)	$33	$44	$46	$393
Cost of strategy (high)	$67	$127	$135	$989
Alternate rate of risky drinkers (20.5% males, 18.4% females)	$11	$18	$19	$117
ICER (Cost to achieve one additional sensible drinker)				
Change in sensible drinking status	$1,120	$1,901	$2,019	$15,354

5 DISCUSSION

Given the excessive alcohol consumption among those whose alcohol consumption places them at-risk in the short term, the substantial level of harm experienced by the community as a result of this pattern of drinking, and the current low rates of screening for alcohol consumption and problems, this study used data from a number of sources to explore the cost effectiveness of different strategies to increase the rate of screening by GPs. Regardless of the assumptions made, the targeted payment strategy appears to be the least cost effective method to achieve a decrease in alcohol consumption, while the other three are reasonably comparable.

This study, which used data from previously published work, was often limited by the availability of data. While the actual cost per drink avoided varies, the relationships between the different strategies are reasonably robust. However, there are some areas which require additional discussion. First, there is evidence that the population which is classified as risky may be significantly larger that that which is used in this study. The BEACH data were used in these analyses to derive the percentage of individuals who visited a GP and were consuming more than the recommended weekly amount of alcohol (4.1% for males and 3.3% for females). However, there is some evidence from studies in an Australian GP setting that these rates may be as high as 20.5% of males and 18.4% of females (Fawcett et al., 2004). Applying these percentages in the sensitivity analysis showed that, while the absolute ICER varied, the overall pattern of the results remained unchanged: the target payment strategy was less cost effective.

An important point in interpreting these results relates to understanding what impacts on costs across different strategies. The total cost increases for academic detailing, computerised reminder system and the CME interactive strategies are a result of increase in the number of GPs that take up the strategies (e.g. the actual cost of outreach visits or software provision), whereas the costs for the targeted payment strategy increase as more patients are screened by their GP. This has clear planning and policy implications with the latter being down stream ongoing costs while the other three strategies have primarily up-front and possibly diminishing costs over time if GP behaviours are permanently modified.

A key outcome from this study is that there is little empirical evidence for the principle that financial rewards are an effective incentive for GPs to modify their practice in defined ways. A recent review of economic incentives on delivery of care points out that not only is the evidence limited, there is currently little understanding of the relationship between the amount

of the incentive payment and the extent of behaviour change (Town et al., 2005). That is, if a larger payment does induce change, what is the relationship between the size of the payment and the rate of change?

Another limitation of this study is that it modelled only individual strategies. Future research might explore the economic impact of combining the introduction of computerised reminder systems or computerised screening (Shakeshaft and Frankish, 2003) as methods of organisational change with various levels of target payments. Alternatively, given the time constraints of GPs, other methods of screening the population and providing brief interventions should be investigated. A recent review of the recommendations of the U.S Preventive Services Task Force found that the average patient in a family practice waiting room requires 25 recommended preventive services, and that, in order to deliver these services to all patients, 7.4 hours per working day is required for each primary care physician (Yarnall et al., 2003) suggesting that - given their current patient load - GPs may not have the time for preventive care.

There is obviously much more to learn about how to change GPs' behaviour with respect to screening for excessive alcohol use, but what is clear is that given the available data using a targeted payment strategy is not an efficient use of resources.

6 REFERENCES

ABS (2004), Vol. 2003 Australian Bureau of Statistics, Canberra.

Ashenden, R., Silagy, C. and Weller, D. (1997) A systematic review of the effectiveness of promoting lifestyle change in general practice. Family Practice; 14, 160-176.

Australian Department of Health and Aging (2004) Australian Department of Health and Aging, Canberra.

Australian Institute of Health and Welfare (2002a), Australia's Health, Canberra.

Australian Institute of Health and Welfare (2002b), National Drug Strategy Household Survey 2001, Canberra.

Australian Institute of Health and Welfare, (2004) Australia's Health, Canberra.

Balas, E. A., Weingarten, S., Garb, C. T., Blumenthal, D., Boren, S. A. and Brown, G. D. (2000) Improving preventive care by prompting physicians. Archives of Internal Medicine, 160, 301-308.

Bauchner, FL, Simpson, L. and Chessare, J. (2001) Changing physician behaviour. Archives of Disease in Childhood, 84, 459-62.

Beaulieu, M. D., Rivard, M., Hudon, E., Beaudoin, C., Saucier, D. and Remondin, M. (2002) Comparative trial of a short workshop designed to enhance appropriate use of screening tests by family physicians. Canadian Medical Association Journal, 167, 1241-6.

Beich, A., Thorsen, T. and Rollnick, S. (2003) Screening in brief intervention trials targeting excessive drinkers in general practice: systematic review and meta-analysis. British Medical Journal, 327, 536-542.

Bero, L. A, Grilli, G., Grimshaw, J. M., Harvey, E. L., Oxman, A. D., & Thomson O'Brien, M. A. (1998). Closing the gap between research and practices: an overview of systematic reviews of interventions to promote the implementation of research findings. British Medical Journal, 317, 465-468.

Bennett, J. and Glasziou, P. (2003) Computerised reminders and feedback in medication management: a systematic review of randomised controlled trials. Medical Journal of Australia., 178, 217-222.

Bernal-Delgado, E., Galeote-Mayor, M., Pradas-Arnal, F. and Peiro-Moreno, S. (2002) Evidence based educational outreach visits: effects on prescriptions of non-steroidal anti-inflammatory drugs. Journal of Epidemiology & Community Health, 56, 653-8.

Bien, T. H., Miller, W. R. and Tonigan, J. S. (1993) Brief interventions for alcohol problems: a review. Addiction 88, 315-355.

Blakeman, T. M., Harris, M. F., Comino, E. J. and Zwar, N. A. (2001) Evaluating general practitioners' views about the implementation of the Enhanced Primary Care Medicare items. MJA, 175, 95-98.

Bonevski, B., Sanson-Fisher, R. W. and Campbell, E. M. (1996) Primary care practitioners and health promotion: a review of current practices. Health Promotion Journal of Australia, 6, 22-31.

Britt, H., Miller, G., Knox, S., Charles, J., Valenti, L., Pan, Y., Henderson, J., Bayram, C., O'Halloran, J. and Ng, A. (2001-2004), BEACH -Bettering the Evaluation and Care of Health: A Continuous National Study of General Practice Activity. University of Sydney and the Australian Institute of Health and Welfare, Canberra.

Brown, C. A., Belfield, C. R. and Field, S. J. (2002) Cost-effectiveness of continuing professional development in health care: a critical review of the evidence. BMJ, 324, 652-655.

Buxton, M., Drummond, M., Van Hout, B., Prince, R., Sheldon, T., Szucs, T. and Vray, M. (1997) Modelling in economic evaluation: an unavoidable fact of life. Health Economics 6, 217-227.

Calnan, M. and Williams, S. (1993) Coronary Heart Disease prevention: The role of the general practitioner. Family Practice 10, 137-151.

Chikritzhs, T., Catalano, P., Stockwell, T., Donath, S., Young, D. and Mathews, S. (2001) Australian Alcohol Indicators, 1990-2001. National Drug Research Institute, Perth.

Chikritzhs, T., Stockwell, T., Heale, P., Dietze, P. and Webb, M. (2000) Trends in alcohol related road injury in Australia 1990-1997. National Drug Research Institute, Curtin University of Technology, Perth.

Claxton, K., Sculpher, M. and Drummond, M. (2002) A rational framework for decision making by the National Institute for Clinical Excellence (NICE). The Lancet, 360.

Cockburn, J., Ruth, D., Silagy, C., Dobbin, M., Reid, Y., Scollo, M. and Naccarella, L. (1992) Randomised trial of three approaches for marketing smoking cessation programmes to Australian general practitioners. BMJ, 304, 691-694.

Commonwealth Department of Health and Aged Care. (1999) Primary care initiatives, Enhanced Primary Care package. Commonwealth Department of Health and Aged Care, Canberra.

Copello, A., Godfrey, C., Heather, N., Hodgson, R., Orford, J., Raistrick, D., Russell, I., Tober, G., Slegg, G. P., Alwyn, T., Kerr, C., Thistlethwaite, G., Barrett, C., Kenyon, R., Carlyle, K., Gillam, R., Handforth, L., John, B., Smith, M., Coulton, S., Farrin, A., Parrott, S., Chalk, P., Champney-Smith, J., Crome, I., Emlyn-Jones, R., Fleming, A., Kahn, A., McBride, A., Parkes, S., Summers, Z. and Williams, P. (2001) United Kingdom Alcohol Treatment Trial (UKATT): Hypotheses, design and methods. Alcohol & Alcoholism 36, 11-21.

Davis, D. A., Thomson O'Brien, M. A., Freemantle, N., Wolf, F. M., Mazmanian, P. and Taylor-Vaisey, A. (1999) Impact of formal continuing medical education: do conferences, workshops, rounds, and other traditional continuing education activities change physician behavior or health care outcomes? JAMA, 282, 867-874.

Davis, D. A., Thomson O'Brien, M. A., Oxman, A. D. and Haynes, R B. (1995) Changing physician performance: a systematic review of the effect of continuing medical education. Journal of the American Medical Association, 274, 700-705.

Dexter, P. R., Wolinsky, F. D., Gramelspacher, G. P., Zhou, X. H., Eckert, G. J., Waisburd, M. and Tierney, W. M. (1998) Effectiveness of computer-generated reminders for increasing discussions about advance directives and completion of advance directive forms. A randomized, controlled trial. Annals Internal Medicine 128, 102-10.

Drummond, M., O'Brien, B., Stoddart, G. and Torrance, G. (1997) Methods for the Economic Evaluation of Health Care Programs, Oxford University Press, Oxford.

Ewing, G., Selassie, A., Lopez, C. and McCutcheon, E. (1999) Self-report of delivery of clinical preventative services by U.S. physicians. American Journal of Preventive Medicine 17, 62-72.

Fawcett, J., Shakeshaft, A., Harris, M., Wodak, A., Mattick, R. and Richmond, R. (2004) Using AUDIT to classify patients into Australian Alcohol Guideline categories. Medical Journal of Australia, 180, 598.

Fleming, M. F. (1997) Strategies to increase alcohol screening in health care settings. Alcohol Health and Research World, 21, 340-351.

Fleming, M. F., Barry, K. L., Manwell, L. B., Johnson, K. and London, R. (1997) Brief physician advice for problem alcohol drinkers: A randomized controlled trial in community-based primary care practices. Journal of the American Medical Association, 227, 1039-1045.

Giuffrida, A., Gosden, T., Forland, F., Kristiansen, I. S., Sergison, M., Leese, B., Pedersen, L. and Sutton, M. (1999) In The Cochrane Library, Vol. Issue 3: 2003 Update Software, Oxford.

Gold, M. R., Seigel, J. E., Russell, L. B. and Weinstein, M. C (1996) Cast-Effectiveness in Health and Medicine Oxford University Press, Oxford.

Gomel, M. K., Wutzke, S. E., Hardcasle, D. M., Lapsley, H. and Reznik, R. B. (1998) Cost-effectiveness of strategies to market and train primary health care physicians in brief intervention techniques for hazardous alcohol use. Social Science of Medicine, 47, 203-211.

Goodman, A. C., Nishiura, E. and Humphreys, R. S. (1997) Cost and Usage Impacts of Treatment initiation: A Comparison of Alcoholism and Drug Abuse Treatments. Alcoholism: Clinical and Experimental Research, 21, 931-938.

Greco, P. J. and Eisenberg, J. M. (1993) Changing physicians' practices. The New England Journal of Medicine, 329, 1271-1274.

Grimshaw, J. M., Shirran, L., Thomas, R., Mowatt, G., Fraser, C., Bero, L., Grilli, R., Harvey, E., Oxman, A. and O'Brien, M. A. (2001) Changing provider behavior: an overview of systematic reviews of interventions. Medical Care, 39, II2-45.

Hansen, L. J., Olivarius, N., Beich, A. and Barfod, S. (1999) Encouraging GPs to undertake screening and a brief intervention in order to reduce problem drinking: a randomized controlled trial. Family Practice, 16, 551-7.

Heywood, A., Ring, I., Sanson-Fischer, R. and Mudge, P. (1994) Screening for cardiovascular disease and risk reduction counselling behaviors of general practitioners. Preventive Medicine, 23, 292-301.

HIC (Health Insurance Commission) (2001), Vol. 2001 Canberra.

HIC (Health Insurance Commission) (2004), Vol. 2004 Canberra.

Hulscher, M. E. J. L., Wensing, M., Grol, R., van der Weijden, T. and van Weel, C. (1999) Interventions to improve the delivery of preventive services in primary care. American journal ofPublic Health, 89, 737-746.

Hulscher, M. E. J. L., Wensing, M., van der Weijden, T. and Grol, R. (1996) In The Conran Library, Vol. Issue 3, 2003 Update Software, Oxford.

Joint Advisory Group on General Practice and Population Health (2001) Commonwealth Department of Health and Aged Care, Canberra.

Kahan, M., Wilson, L. and Becker, L. (1995) Effectiveness of physician-based interventions with problem drinkers: A review. Canadian Medical Association Journal, 152.

Kouides, R. W., Bennett, N. M., Lweis, B., Cappuccio, J. D., Barker, W. H. and LaForce, M. (1998) Performance-based physician reimbursement and influenza immunization rates in the elderly. American Journal of Preventive Medicine, 14, 89-95.

Lewis, C, Caney, C., Leake, B. and Schwartz, J. S. (1991) The counselling practices of internists. Annals of Internal Medicine 114, 54-58.

Lobo, C. M., Frijling, B. D., Hulscher, M. E. J. L., Bernsen, R. M. D., Braspenning, J. C., Grol, R., Prins, A. and van der Wouden, J. C. (2002) Improving quality of organizing cardiovascular preventive care in general practice by outreach visitors: a randomized controlled trial. Preventive Medicine, 35, 422-429.

Lock, C. A. and Kaner, E. F. S. (2000) Use of marketing to disseminate brief alcohol intervention to general practitioners: promoting health care interventions to health promoters. Journal of evaluation in clinical practice, 6, 345-357.

Lock, C. A., Kaner, E. F. S., Heather, N., McAvoy, B. R and Gilvarry, E. (1999) A randomized trial of three marketing strategies to disseminate a screening and brief alcohol intervention programme to general practitioners. British Journal ofGeneral Practice, 49, 695-698.

Mason, J., Freemantle, N., Nazareth, I., Eccles, M., Haines, A. and Drummond, M. (2001) 'When is it cost-effective to change the behavior of health professionals? JAMA, 286, 2988-2992.

Mathers, C., Vos, E., Stevenson, C. and Begg, S. (2001) The burden of disease and injury in Australia. Bulletin of the World Health Organization 79, 1076-1084.

McAvoy, B. R., Kaner, E. F. S., Lock, C. A., Heather, N. and Gilvarry, E. (1999) Our healthier nation: are general practitioners willing and able to deliver? A survey of attitudes to and involvement in health promotion and lifestyle counselling. British Journal of General Practice, 49, 187-190.

McCormick, R., Adams, P., Powell, A., Bunbury, D., Paton-Simpson, G. and McAvoy, B. R. (1999) Encouraging general practitioners to take up screening and early intervention for problem use of alcohol: a marketing trial. Drug and Alcohol Review 18, 171-177.

National Expert Advisory Committee on Alcohol (2001) Commonwealth Department of Health and Aged Care, Canberra.

National Preventive and Community Medicine Committee of The Royal Australian College of General Practitioners (2002) Guidelines for preventive activities in general practice. Australian Family Physician, 31, S l 27-28.

Ockene, J. K., Adams, A., Hurley, T. G., Wheeler, E. V. and Hebert, J. R. (1999) Brief physician and nurse practitioner delivered counseling for high-risk drinkers: Does it work? Archives of Internal Medicine, 159, 2198-2205.

Productivity Commission. (2003) Commonwealth of Australia, Canberra.

Raupach, J., Rogers, W. A., Magarey, A., Lyons, G. and Kalucy, L. (2001) Advancing health promotion in Australian general practice. Health Education and Behaviour, 28, 352-367.

Richmond, R., Heather, N., Wodak, A., Kehoe, L. and Webster, I. (1995) Controlled evaluation of a general practice-based brief intervention for excessive drinking. Addiction, 90, 119-32.

Richmond, R. L., Kehoe, L., Hailstone, S., Wodak, A. and Uebel-Yan, M. (1999) Quantitative and qualitative evaluations of brief interventions to change excessive drinking, smoking and stress in the police force. Addiction; 94, 1509-1521.

Ritchie, L. D., Bisset, A. F., Russell, D., Leslie, V. and Thomson, I. (1992) Primary and preschool immunisation in Grampian: progress and the 1990 contract. BMJ, 304, 816-819.

Rydon, P., Redman S., Sanson-Fisher RW. and AL., R (1992) Detection of alcohol-related problems in general practice. Journal of Studies on Alcohol, 53, 197-202.

Shakeshaft, A. and Frankish, C. (2003) Using patient-driven computers to provide cost-effective prevention in primary care: a conceptual framework. Health Promotion International, 18, 67-77.

Shanahan, M., Doran, C, Gibson, A., Stafford, J., &Mattick, R (2005) Interventions for Excessive Alcohol Use: Costs and Outcomes of Pharmacotherapies and Other Treatments. Sydney National Drug and Alcohol Research Centre, University of New South Wales.

Silagy, C. and May, F. (1997) Flinders University, Adelaide.

Silagy, C., Muir, J., Coulter, A., Thorogood, M., Yudkin, P. and Roe, L. (1992) Lifestyle advice in general practice: Rates recalled by patients. BMJ, 305, 871-874.

Spandorfer, J., Yedy, I. and Turner, B. (1999) Primary Care Physicians' Views on Screening and Managment of Alcohol Abuse: Inconsistencies with National Guidelines. The Journal of Family Practice, 48, 899-902.

Thomson O'Brien, M. A., Freemantle, N., Oxman, A., Wolf, F. M., Davis, D. A. and Herrin, J. (2001) In The Cochrane Library, Issue 3, 2003 Update software, Oxford.

Thomson O'Brien, M. A., Oxman, A. D., Davis, D. A., Haynes, R. B., Freemantle, N. and Harvey, E. L. (1997) In The Cochrane Library, Issue 3, 2003 Update software, Oxford.

Town, R., Kane, R., Johnson P. and Butler, M. (2005) Economic Incentives and Physicians' Delivery of Preventive Care. American Journal of Preventive Medicine 28, 234-240.

Tugwell, P., Bennet, K., Sackett, D. and Haynes, R (1985) The measurement iterative loop: a framework for the critical appraisal of need, benefits, and costs of health interventions. Journal of Chronic Diseases, 38, 339-351.

Wallace, P., Cutler, S. and Haines, A. (1988a) Randomised controlled trial of general practitioner intervention in patients with excessive alcohol consumption. British Medical Journal, 297, 663-668.

Wallace, P. G., Cutler, S. and Haines, A. P. (1988b) Randomised controlled trial of general practitioner intervention in patients with excessive alcohol consumption. BMJ, 297, 663-668.

Weller, D., Litt, C, Pols, R, All, R, Southgate, L. and Harris, R. (1992) Drug and alcohol related health problems in primary care - what do GPs think? Medical Journal of Australia., 156, 43-48.

Wensing, M. and Grol, R. (1994) Single and combined strategies for implementing changes in primary care: a literature review. International Journal for Quality in Health Care 6, 115-132.

WHO Brief Intervention Study Group (1996) A cross-national trial of brief interventions with trial drinkers. American Journal of Public Health, 86, 948-955.

Wilson, D. M. C, Siliska, D., Singer, J., Williams, K., Alleynes, J. and Linsay, E. (1992) Family physicians and exercise counselling: can they be influenced to provide more? Canadian Family Physician, 38, 2003-2010.

Wutzke, S. E., Shiell, A., Gomel, M. K. and Conigrave, K. M. (2001) Cost effectiveness of brief interventions for reducing alcohol consumption. Social Science & Medicine, 52, 863-870.

Yarnall, K. S. H., Pollak, K. I., Ostbye, T., Krause, K. M. and Michener, J. L. (2003) Primary care: Is there enough time for prevention? American Journal of Public Health, 93, 635-641.